What is claimed:

1. A method for the production of differentiated hematopoietic cells comprising:

a) culturing bone marrow stem cells under conditions that promote synchronous progression through the cell cycle;

b) contacting the cells with at least one growth factor or cytokine at a predetermined phase of the cell cycle; and

c) subculturing the cells until differentiated hematopoietic cells are produced.

2. The method of claim 1, wherein the at least growth factor cytokine comprises G-CSF, GM-CSF, and steel factor.

3. The method of any one of claims 1-2, wherein culturing the cells under conditions that promote synchronous progression through the cell cycle comprises culturing the cells in the presence of steel factor, thrombopoietin, and FLT3-ligand.

4. The method of any one of claims 1-3, wherein the step of subculturing the cells is carried about for about 14 days.

5. The method of any one of claims 1-4, wherein the predetermined phase of the cell cycle is mid-S phase.

6. The method of claim 5, wherein mid-S phase occurs about 32 hours after initiation of the culturing of the stem cells under conditions that promote synchronous progression through the cell cycle.

7. The method of any one of claims 1-6, wherein the differentiated hematopoietic cells comprise megakaryocytes.

8. The method of any one of claims 1-6, wherein the differentiated hematopoietic cells comprise platelets.

9. The method of any one of claims 1-6, wherein the differentiated hematopoietic cells comprise proliferative granulocytes.

10. The method of any one of claims 1-4, wherein the predetermined phase of the cell cycle is late S phase.

11. The method of claim 10, wherein late S phase occurs about 40 hours after initiation of the culturing of the stem cells under conditions that promote synchronous progression through the cell cycle.

12. The method of any one of claims 1-4 or 10-11, wherein the differentiated hematopoietic cells comprise mature (non-proliferative) granulocytes.

13. The method of any one of claims 1-12, further comprising isolating the differentiated hematopoietic cells from the subculture.

14. A method of treating a subject having cytopenia comprising administering to the subject a therapeutically effective amount of the differentiated hematopoietic cells produced according to the methods of any one of claims 1-13.

15. A method of preventing cytopenia in a subject comprising administering to the subject a therapeutically effective amount of the differentiated hematopoietic cells produced according to the methods of any one of claims 1-13.

16. The method of any one of claims 14-15, wherein the subject has or is at risk for developing cytopenia associated with cancer chemotherapy or radiation therapy.

17. The method of any one of claims 14-16, wherein the subject has or is at risk for developing cytopenia associated with a bone marrow transplant.

18. The method of any one of claims 14-17, wherein the cytopenia is thrombocytopenia.

19. The method of any one of claims 14-2-, wherein the cytopenia is granulocytopenia.

20. Hematopoietic cells produced by the methods of any one of claims 1-13.

21. The hematopoietic cells of claim 20, which are macrophages.

22. The hematopoietic cells of claim 20, which are platelets.

23. The hematopoietic cells of claim 20, which are proliferative granulocytes.

24. The hematopoietic cells of claim 20, which are mature (non-proliferative) granulocytes.